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Miniature Electronic Safing and Arming Device

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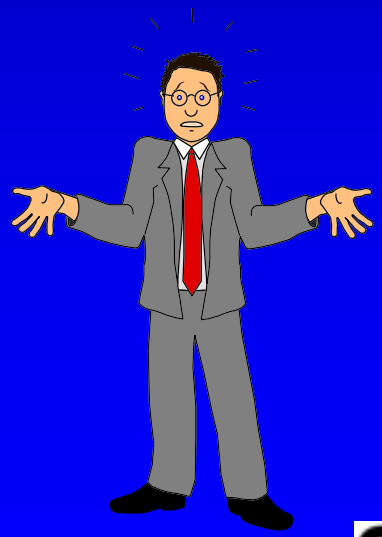
The Challenge

- Develop a miniature, low cost, all electronic safing and arming device.
- Provide direction for future technology improvements and developments

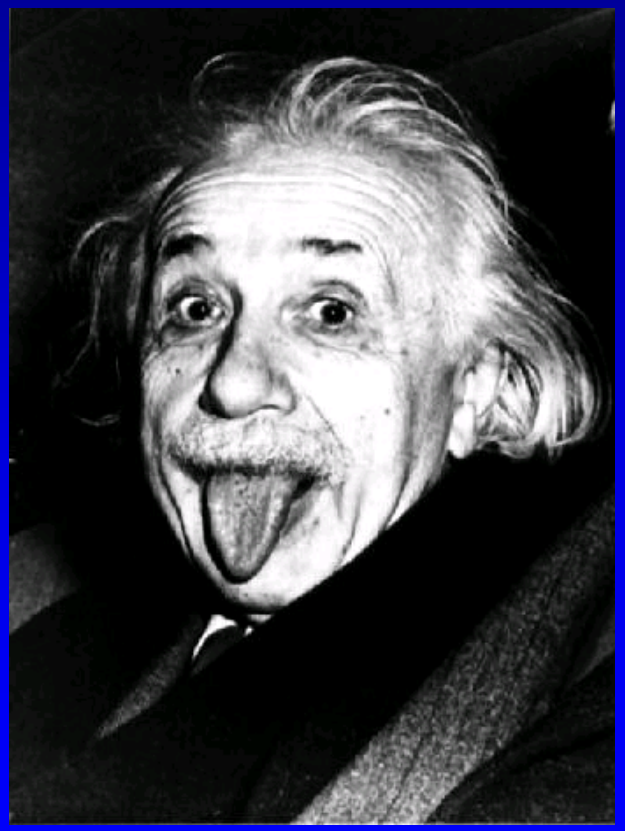
Why an ESAD?

- No primary explosives
- No moving parts
- Long stockpile storage life
- Increased testability
- Adaptable to operating in harsh environments



Why an ESAD (Cont.)

- Additional intelligence can be incorporated into the design which can include target detection, fuzing logic, and mission specific programmability

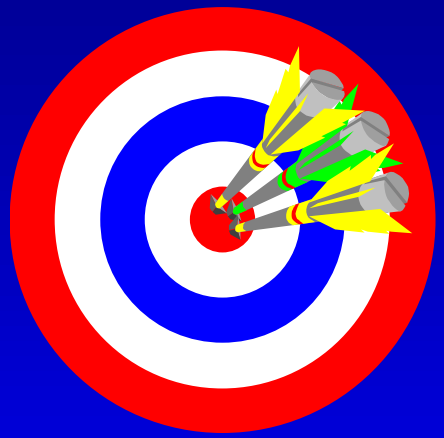


DEFINING THE GOALS

- Initial design goals were based on artillery fuze applications

- Future design goals will include mortar, and tank fuze applications

SYSTEM DESIGN GOALS

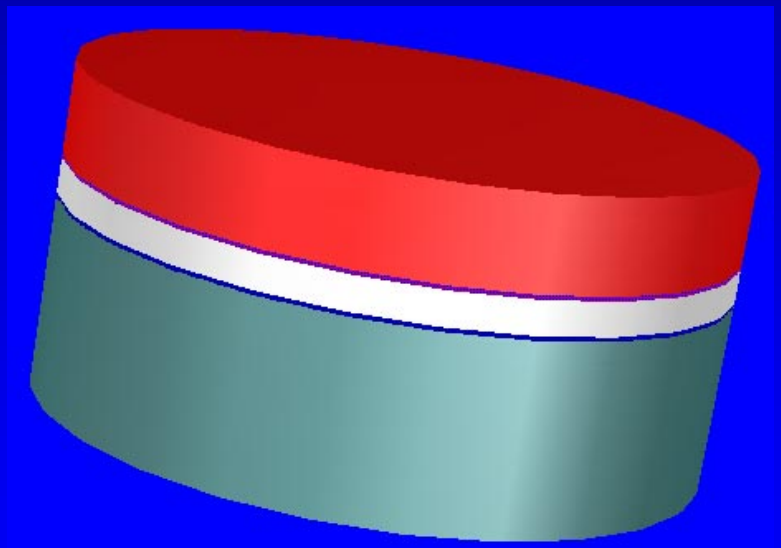


- Minimize Volume
- Minimize Cost
- Address Manufacturablility
- Define Technology Improvements Needed
- Define New Technologies Needed

ENABLING TECHNOLOGIES

- Low energy detonators
- Solid state high voltage switch
- High voltage ceramic capacitors
- Miniaturization of electronic components with increased functionality (pocket electronics)

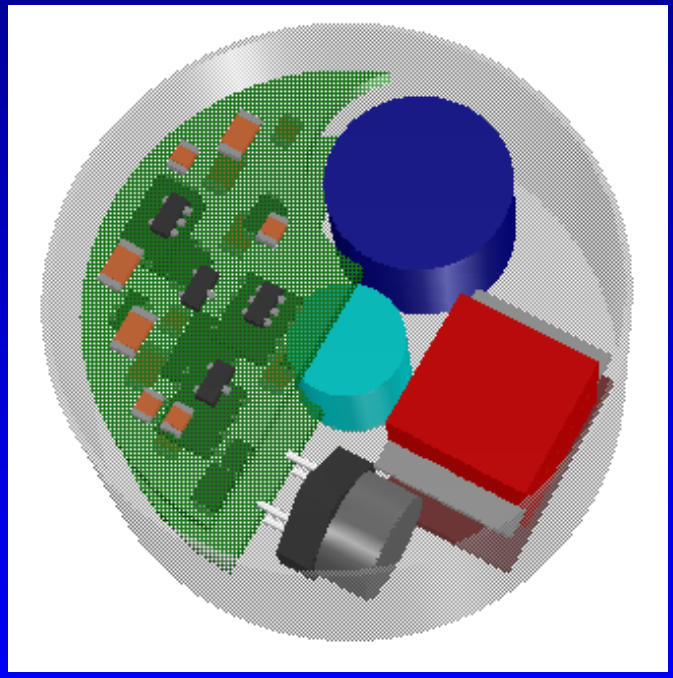
VOLUME GOALS



- FY96 - 3.77 in^3
  - Original goal
- FY97 - 1.25 in^3
  - Achieved in hardware
- FY98 - 0.85 in^3
  - Achieved Analytically
- FY99 - 0.75in^3
  - Progressing

FY97 MINIATURE ESAD

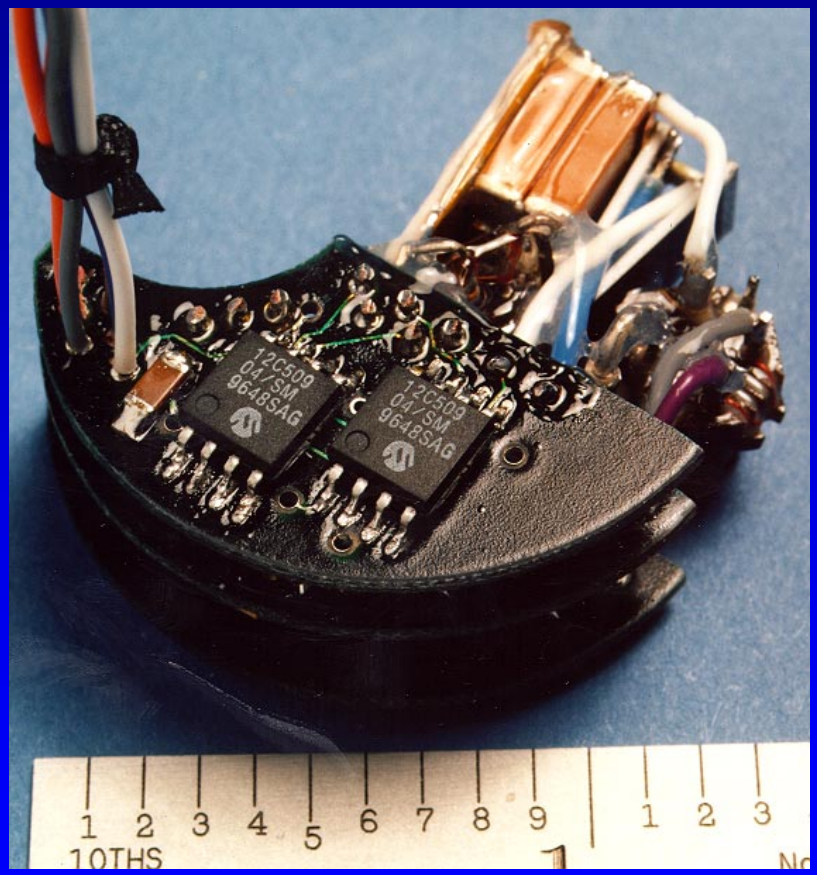
CONTENTS:
Setback Activated Battery
Safety Logic
Acceleration Sensor
HV Drive Circuitry
HV Converter
Solid State HV Switch
HV Switch Gate Drive
Detonator
HNS Pellet



1.5 inch diameter
0.7 inch high

1.25 Cubic Inches

FY97 ESAD (TOP)



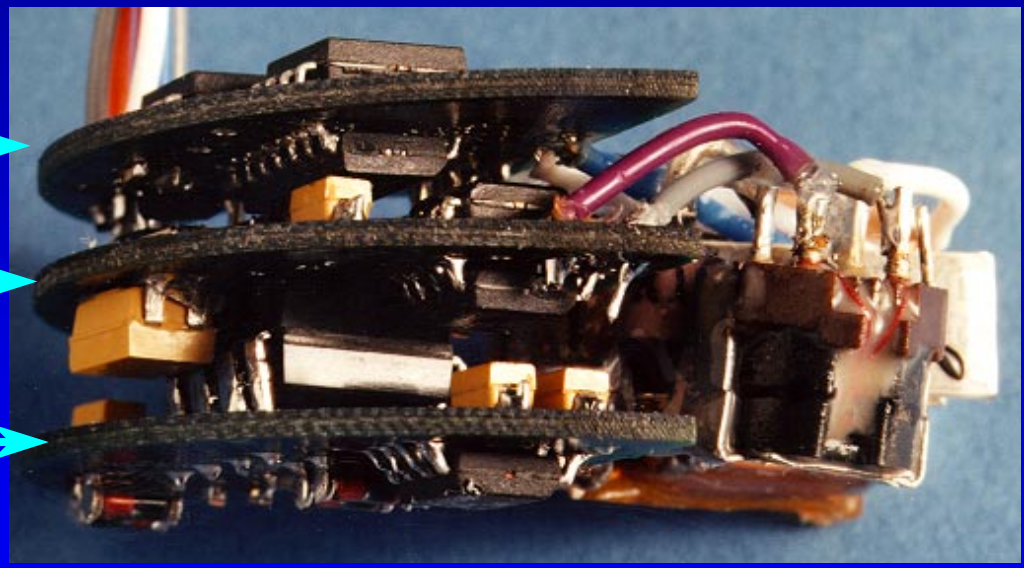
The FY97 miniaturized design is functional and successfully fires Standard Navy Chip Detonators with HNS IV pellets

FY97 ESAD (SIDE)

Safety Logic

HV Converter Drive

MCT Gate Drive
(Deleted in FY98)



FY97 ESAD (BOTTOM)

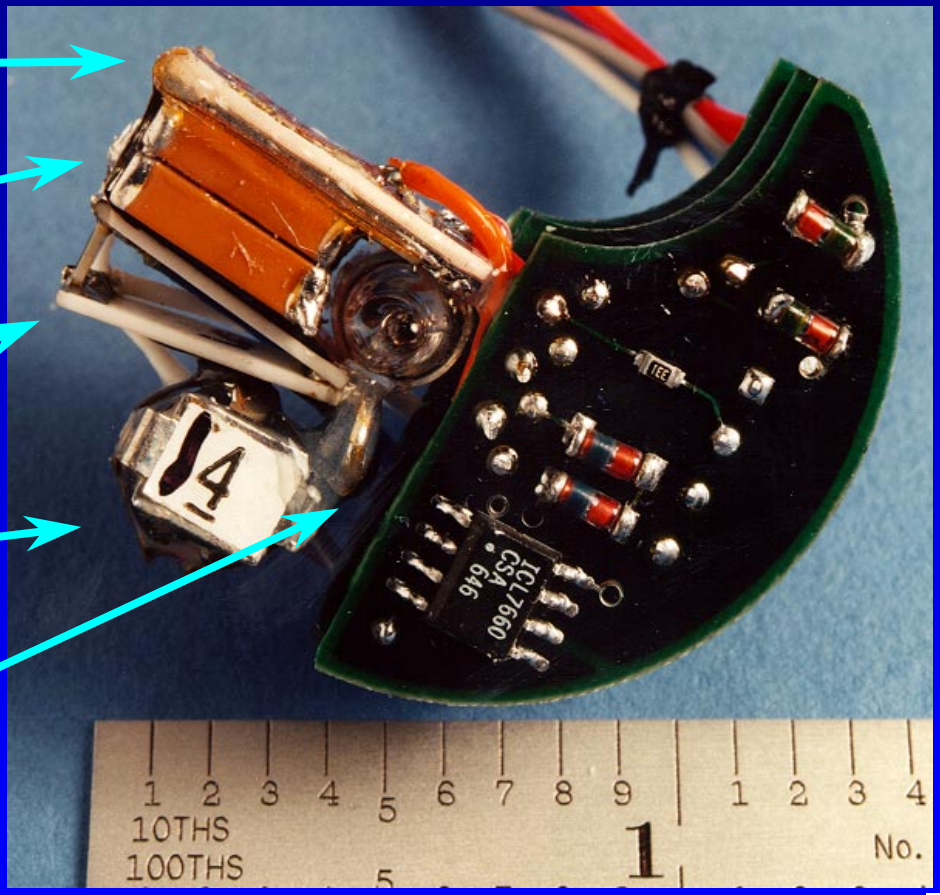
HV MCT Switch

2 HV Capacitors

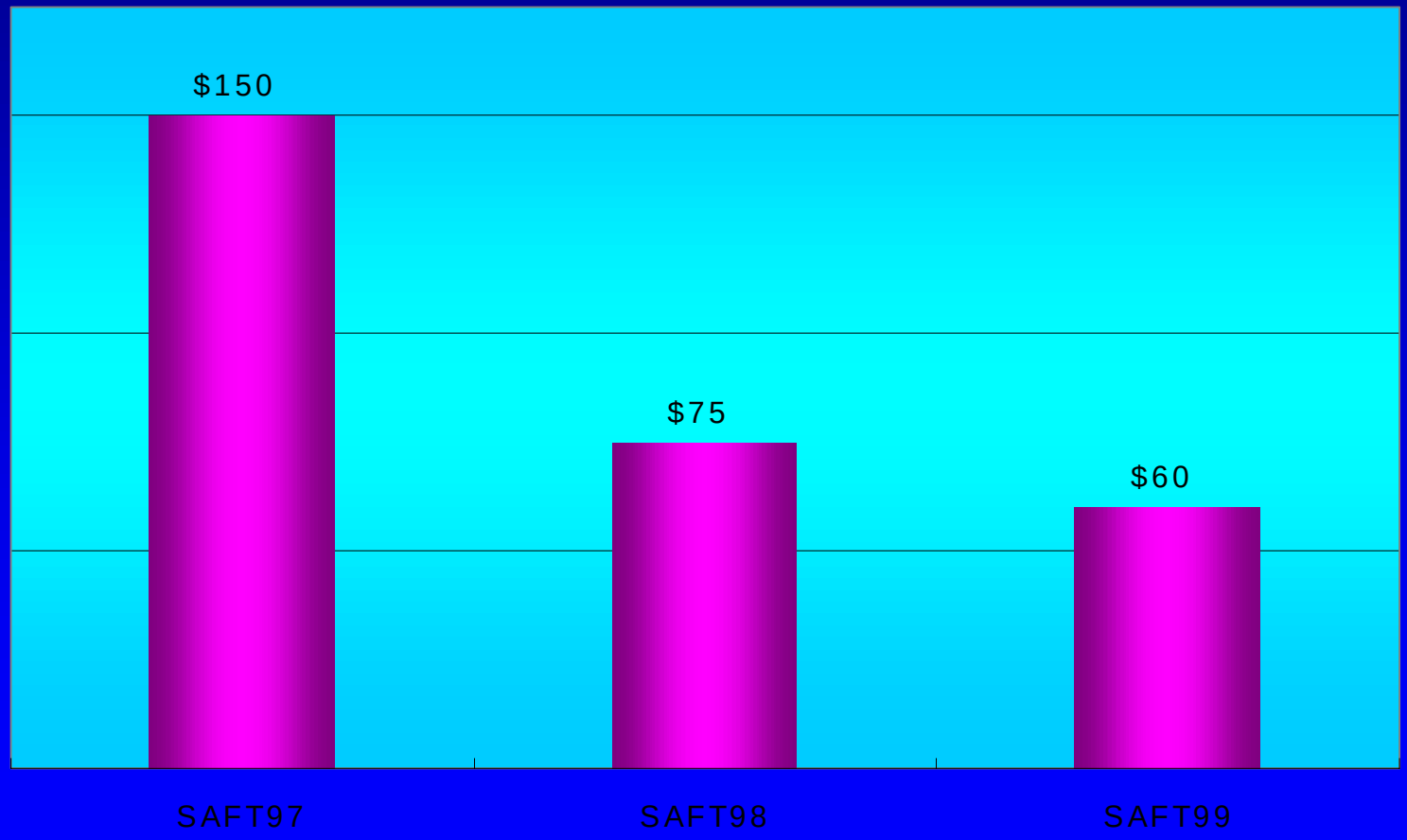
HV Bleed Resistors

Flyback Transformer

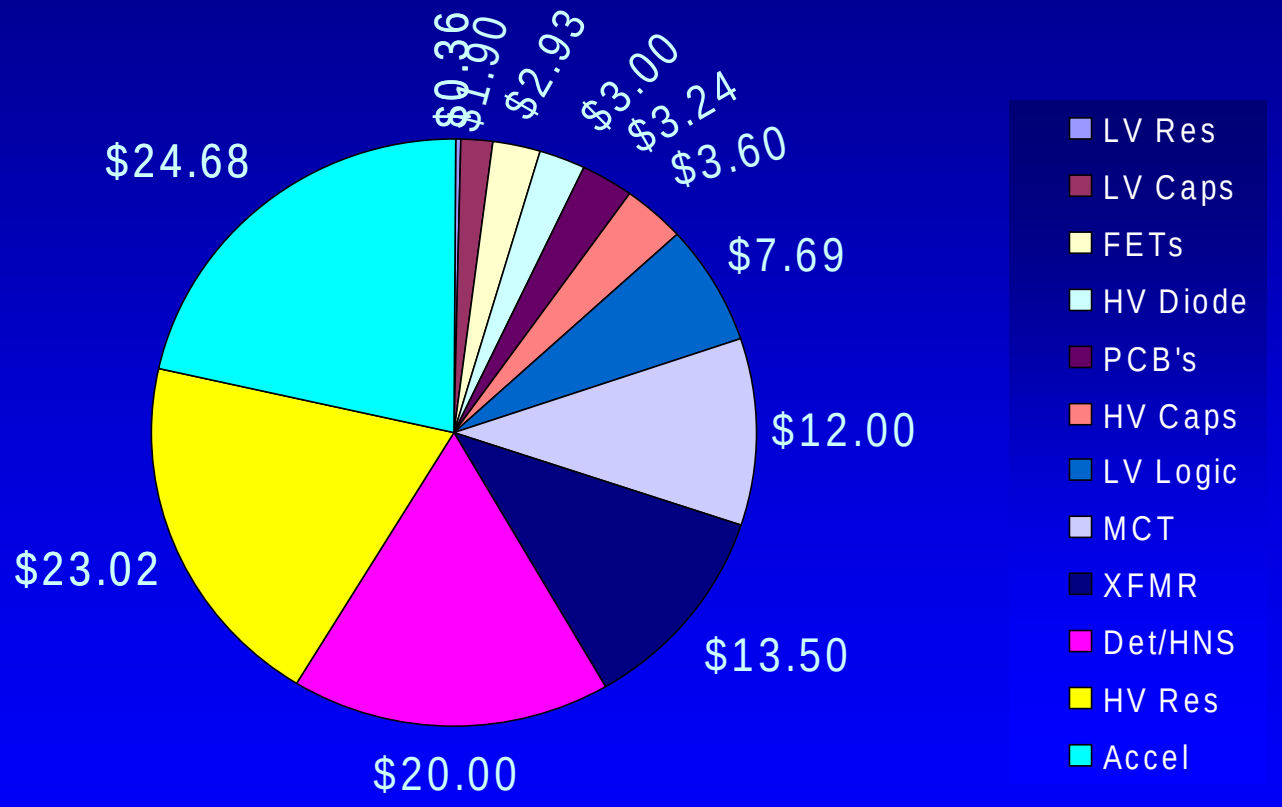
HV Diode



MATERIAL COST GOALS
(1k Units)



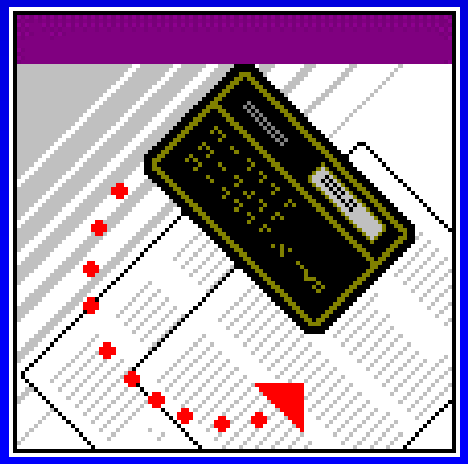
COMPONENT COST BREAKDOWN



Total Component Cost = $115.09

COMPONENT COST SUMMARY

LV Parts	$14.50	13%
Accelerometer	$24.68	21%
DET & HNS	$20.00	17%
HV Parts	$56.74	49%
Total	$115.92	100%



CURRENT TECHNOLOGY IMPROVEMENTS

- HV MCT Switch
  - Improvements in switch gate design
    - Simplifies the required gate drive circuitry
  - Improvements in packaging to better match ESAD applications
    - Two device packages will be available
      - Commercial TO-218 Package
      - Harris Thin Pack (half size for size 6 die)

CURRENT TECHNOLOGY IMPROVEMENTS

- High Voltage Capacitor
  - Improvements in component internal design
    - Improved production yield
    - Increased component reliability
- Flyback Transformer
  - Improvements in component design and production techniques
    - Design modified and production techniques improved

FUTURE GOALS

- Implement a design using the current technology improvements
- Incorporate manufacturabiltiy improvements
- Define requirements for mortar and tank fuze applications